Construction Monitoring of Paving Fabrics Systems to Reduce Reflective Cracking

INTERIM REPORT

by

Farshad Amini & Bradnado Turnquest
Department of Civil & Environmental Engineering
Jackson State University

In Cooperation with the

Mississippi Department of Transportation
Burns Cooley and Dennis, Inc.

and the

U.S. Department of Transportation
Federal Highway Administration

Jackson State University
Jackson, Mississippi

August 2008

Technical Report Documentation Page

1.Report No.	2. Government Accession No.	3. Recipient's Catalog No.
FHWA/MS-DOT-RD-08-184		

4. Title and Subtitle	5. Report Date
Construction Monitoring of Paving Fabrics Systems to Reduce Reflective Cracking	August 2008
	6. Performing Organization Code MS-DOT-RD-08-184
7. Author(s) Farshad Amini & Bradnado Turnquest	8. Performing Organization Report No.
9. Performing Organization Name and Address Department of Civil & Environmental Engineering Jackson State University 1400 J. R. Lynch Street P.O. Box 17068 Jackson, MS 39217-0168	10. Work Unit No. (TRAIS)
	11. Contract or Grant No. State Study 184
12. Sponsoring Agency Name and Address Mississippi Department of Transportation Research Division P O Box 1850 Jackson, MS 39215-1850	13. Type Report and Period Covered Interim Report – July 2007 – July 2008
	14. Sponsoring Agency Code

15. Supplementary Notes
Conducted in cooperation with the Mississippi Department of Transportation and the U.S. Department of Transportation Federal Highway Administration

16. Abstract
Reflective cracking has been a major issue in pavement rehabilitation for many decades, due in part to shrinkage, constant expansion and contraction of pavement. These cracks result in uncomfortable rides and further deteriorate highways and local streets. Because of these problems, the application of paving fabrics systems to reduce reflective cracking is being investigated. If applied correctly, these paving fabrics should control moisture protruding to the base, provide tensile reinforcement, and prevent or reduce the propagation of cracks to the new overlay. The performance of paving fabrics is related to several factors including proper installation procedures. To assure the performance record for paving fabrics, the installation specification, and guidelines must be strictly enforced. This report presents the construction monitoring of twelve paving fabric research sections. Lessons learned and suggestions for installation improvements are discussed.

17. Key Words	18. Distribution Statement
Paving fabrics, reflective cracking, construction monitoring, ovrerlays, pavement maintenance	Unlimited

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	46	

Form DOT F 1700.7 (8-72)

Reproduction of completed page authorized

ACKNOWLEDGEMENT

This interim report presents the results of a construction monitoring study titled "Construction Monitoring of Paving Fabrics Systems to Reduce Reflective Cracking", conducted by the Department of Civil and Environmental Engineering, Jackson State University, in cooperation with the Mississippi Department of Transportation (MDOT), Burns Cooley and Dennis Inc., and the U.S. Department of Transportation, Federal Highway Administration.

The authors would like to express their sincere appreciation to Mr. William Barstis of the MDOT's Research Division, for his contribution and constant encouragement. Thanks are also extended to the Mr. Jeff Wages of the MDOT's Research Division, Mr. Alan Cross, MDOT's District 5 Materials Engineer, and Dr. Randy Ahlrich of Burns Cooley and Dennis Inc. for their technical support and active participations during this project. Thanks are also due to the MDOT Research Advisory Committee for their interest in this project.

Abstract

Reflective cracking has been a major issue in pavement rehabilitation for many decades, due in part to shrinkage, constant expansion and contraction of pavement. These cracks result in uncomfortable rides and further deteriorate highways and local streets. Because of these problems, the application of paving fabrics systems to reduce reflective cracking is being investigated. If applied correctly, these paving fabrics should control moisture protruding to the base, provide tensile reinforcement, and prevent or reduce the propagation of cracks to the new overlay. The performance of paving fabrics is related to several factors including proper installation procedure. To assure the performance record for paving fabrics, the installation specification, and guidelines must be strictly enforced.

This report presents the construction monitoring of twelve paving fabric research sections. Lessons learned and suggestions for installation improvements are discussed.

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1. Introduction

1.1 Background

Due to the rising cost in construction, materials, and the limitations of funding, it is important for researchers, manufacturers, and engineers to provide innovations, including introducing new materials, and improving construction procedures to increase pavement performance. The current method of increasing the pavement thickness will only postpone the inevitable in many pavement areas, that being reflective cracks (e.g., Button and Chowdhury, 2006; Amini, 2005; Hughes and Somers, 2000; Marienfield and Baker, 1999; Kidd, 1999; Browning, 1999). This project evaluates the correct installation of a polypropylene, staple fiber, needle-punched, non-woven material known as paving fabric as an under seal for paving overlay. The paving material is resistant to chemical attack, rot, and mildew. In the event that cracks do propagate through the fabric and to the surface of the pavement, rupturing will not occur and instead provide a waterproofing membrane.

The purpose of a paving fabric is to provide a waterproofing barrier and a stress relieving membrane within the paving structure. The placement of this paving fabric during construction is simple. However, special care must be taken during construction for proper performance (e.g., Rahman, et al., 1989; Barazone, 1990; Barazone, 2000; and Sposito, 1999). This report presents the results of construction monitoring of the twelve research sections.

1.2 Objective

The primary objective of this research project is to evaluate long term performance of paving fabric systems. The long term performance of paving fabric

sections will be compared with control sections that will incorporate sealing, milling, and asphalt paving overlay only, monitored annually for seven years.

2. Project Location

The project, a four-lane highway, is located in Rankin County (City of Pearl MS) in the outside lane of US 80 in the westbound direction, beginning at the west side of the US 80/SR 475 intersection and extending approximately 1 ¼ miles to a point approximately ¼ mile west of South Fox Hall Road (see map in appendix I).

3. Project Description

Figures 1 and 2 show typical transverse and longitudinal cracks in the pavement. This portion of roadway indicates many distresses in asphalt pavements including spalling and transverse cracking with the need for milling, sealing, and overlay. There were cracks of considerable lengths and widths, small pot holes, and sections with uneven roadway. These characteristics made this part of roadway a suitable location for research purposes.

Figure 1.Typical Cracks in the Pavement

Figure 2. Typical Cracks in Pavement

4. Paving Fabrics Specifications and Tests Methods

The paving fabric was a geo-textile type IV material and was in accordance with AASHTO M288-92 (AASHTO, 1993). Table 1 outlines the minimum requirements of the paving fabric.

Table 1. Minimum Requirements of Paving Fabrics

Properties	**American Standard**	**Test Method**
Mass Per Unit Area	4.0 oz/sq yd	ASTM D 3776
Tensile Strength	90 lbs	ASTM D 4632
Tensile Elongation	50%	ASTM D 4632
Asphalt Retention	0.20 gal/yd^2	ASTM D 6140
Melting Point	300°F	ASTM D 276-87
Surface Texture	Heat-Set On One Side	Visual Inspection

In this project, the paving fabric was kept dry and wrapped such that it was protected from outside elements during shipping and storage (Propex Fabrics, 2005; Propex Geosynthetics, 2006). The fabric was labeled in accordance with AASHTO D 4873-88 "Standard Guide for Identification, Storage, and Handling of Geotextiles" (AASHTO, 1988).

The paving fabric strength and permittivity tests were performed at the MDOT Central Lab. The paving fabric had a tensile strength of 120 lbs and the permittivities for four samples were 1.97, 1.38, 1.43 and 1.36 respectively. The fabric's strength tests methods were in accordance with AASHTO D4751 (AASHTO, 1987), D4632 (AASHTO, 1991a), and D4533 (AASHTO, 1991b), while the permittivity tests were in accordance with AASHTO D4491 (AASHTO, 1999). Complete specifications and lab tests results are included in Appendix II and III, respectively.

5. Construction Procedures

5.1 Lane Closure

The construction of the research project was performed by APAC Construction Company. Due to construction, the research section was closed off from traffic at 8:30am every morning and re-opened at 4:30pm.

5.2 Test Section

Before any construction began on the project, a 300-ft test section was constructed. The purpose of the test section was to determine the adequate tack coating rate that must be applied as well as to determine if the contractor is capable of installing the paving fabric correctly as described in the specifications. A 300-ft-section, starting from station 295+00 and ending at station 292+00, was selected as the test section

(shown in Table 2). The section was milled 1 ½-inch deep and approximately 12-ft wide. It was then brushed to remove all loose asphalt and excess dust. Figures 3, 4, and 5 show the milling process, brushing, and the complete milled test section, respectively. The specifications indicated a tack coating application rate between 0.22 to 0.30 gallons per square yard and the wrinkles in the fabric were less than ½ inch. However, all of the valves on the mobile truck used to apply the tack coat were not open, resulting in a non-uniform application which was not accepted by project engineers and inspectors. As a result, multiple runs on the section were performed to obtain uniformity. After a day of offsite testing, the problem was resolved and the adequate tack coating application rate, as determined on the test section, was 0.25 gallons per square yard. The construction daily reports are included in Appendix IV.

Figure 3. Milling of Test Section

Figure 4. Brushing after Milling of Test Section

Figure 5. Milled Test Section

When placing the paving fabric, special care was taken to ensure that the wheels from the tractor, equipped with an attachment that allowed the placement of a roll of fabric on the road surface up to 12 ½-ft, did not damage the fabric. In addition, the fabric was inspected to ensure that there was not excess bleeding through the fabric from the tack coat (see Figures 6 through9). For this to be accomplished, the driver kept the turning of the equipment wheel to a minimum and made sure that the fabric was kept in full tension during placement, to reduce wrinkles. After placement, all excess wrinkles were pulled out by hand, rolled with a steel roller and allowed to adhere to the tack coating before paving overlay could begin.

Figure 6. Placing Fabric on Test Section

Figure 7. Placement of Paving Fabric

Figure 8. Wrinkles after Placement of Fabric

Figure 9. Engineer Inspecting of Fabric after Placement

The test section was constructed with the same equipment, personnel, and application rate that will be used during construction. When the contractor demonstrated the ability to apply the tack coating and to place the paving fabric in the test section in accordance with the specifications, Burns Cooley and Dennis, Inc. cut cores in the test section, and the construction of the research sections commenced. However, when the contractor was unable to demonstrate the ability to install the tack coating and paving fabric, construction was not allowed to resume until the necessary adjustments were made (see Figures 10-12). Additional pictures are shown in Appendix V.

Figure 10. Non Uniform Tack Coat on Test Section

Figure 11. Applying Uniform Tack Coat on Test Section

Figure 12. Cutting Core after Paving of Test Section

5.3 Cracks and Sealing

Measures of crack severity were studied and recorded prior to construction by MDOT. Some sections had more severe cracks than others (see Figures 1, 2 and 13). The engineers recorded the number and length of transverse cracks at the beginning and end of each research section. In sections requiring sealing, cracks were cleaned thoroughly using a high pressure blower by Sunbelt Sealing, Inc. before applying emulsion. A special metal tool was used to spread and compact the emulsion into the cracks to ensure uniformity (see Figures 14 through 16). Traffic was not allowed on the sealed cracks until they were properly dried.

Figure 13. Cracks in Section 9

Figure 14. Cleaning Cracks in Section 9

Figure 15. Sealing Cracks in Section 9

Figure 16. Completion of Sealing in Section 11

5.4 Weather Conditions

Weather conditions were ideal for construction with high temperatures ranging between 92 and 98 degrees and no rainfall for the 5 days of construction.

5.5 Equipment

A tractor specially equipped with a roller attachment on the front end was used for the placement of the paving fabric on the roadway. A high pressure hydraulic blower was used for the cleaning of cracks, and a sealant hose was used to apply the sealant to the cleaned cracks. A Roadtec milling machine and a Roadtec paving machine were used for milling and paving, respectively by Mississippi Paving Company. Steel rollers were used for the compaction of the asphalt after paving. Brushers were provided by APAC Construction Company to remove dust, and rubber tire backhoes were used to remove debris from the pavement before, during, and after construction. Burns Cooley and Dennis, Inc. geotechnical firm used two core cutting machines to cut cores along the research sections.

5.6 Construction of Research Sections

The description, length of section (ft), of the overlay thickness (inches), for the twelve research sections are shown in Table 2.

Table 2. Summary of Research Sections

Section	Description	Length of Section (ft)	Overlay Thickness (in)	Station
TEST	Milled	300	1.5	295+00 to 292+00
1	Control, no paving fabrics, no sealing of existing cracks, milled	500	1.5	291+50 to 286+50
2	Paving fabrics, milled	500	1.5	286+00 to

				281+00
3	Paving fabrics, milled	500	3.0	279+50 to 274+50
4	Control section, no paving fabrics	500	1.5	274+00 to 269+00
5	Control section, no paving fabrics, seal existing cracks, non-milled	500	1.5	268+50 to 263+50
6	Paving fabrics, non-milled	500	1.5	263+00 to 258+00
7	Paving fabrics, sealed	500	1.5	257+50 to 252+50
8	Paving fabrics, non-sealed	500	1.5	252+00 to 247+00
9	Control section, no paving fabrics	500	3.0	245+50 to 240+50
10	Paving fabrics, non-milled	500	3.0	240+00 to 235+00
11	Paving fabrics, sealed	500	3.0	234+50 to 229+50
12	Paving fabrics, non-sealed	500	3.0	229+00 to 224+00

All sections were constructed the same way as that in the test section in terms of the tack coating and fabric placement. All sections were constructed adjacent to one another, with a minimum separation of 50 feet. When the overlay thickness changes, a separation of 150 feet for each 1 ½" of finished grade differential was provided between sections, to provide adequate length for overlay thickness transition. Sections 1, 2, and 3

were milled as one 1,500-ft long section, plus the 50-ft required separation between the adjacent sections. When there was excess bleeding of the tack through the paving fabric, as was seen in section 6, fine grain sand was spread on the fabric to absorb the excess tack, and was then removed before paving. All wrinkles that could not be removed were cut, and small tears in the fabric were patched and nailed down. These conditions were considered very appropriate for the construction of these sections.

5.7 Tasks and Responsibilities

This research project is a collaborative effort among Jackson State University (JSU), Burns Cooley and Dennis Inc. (BCD), and the Mississippi Department of Transportation (MDOT). Table 3 shows the companies and their respective responsibilities during construction.

Table 3. Tasks and Responsible Parties

Task	Company
Provide project engineer for correct installation of fabric and produce daily construction reports.	JSU
Provide project engineers and inspectors to measure and report quantities, and oversee daily construction	MDOT
Full depth coring on existing pavement before milling, sealing, or overlay and provide geotechnical engineering services during construction	BCD
Prime contractor, debris removal, traffic control	APAC Construction Company
Milling and paving	Mississippi Paving Company
Cleaning and sealing of cracks	Sunbelt Sealing Inc.
Installation of paving fabric	Cheek's Construction Company

6. Lessons Learned

First, special care must be taken to ensure that there is uniform tack coating applied to the surface at an adequate rate so that the paving fabric adheres uniformly without any blotching or excess bleeding. Inadequate coating could result in loose fabric that does not perform as expected and allow cracks to propagate from the existing surface. In most cases, the tack coat application rate was less for non-milled pavement surfaces than that for milled surfaces. If the same rate is used on both surfaces there may be a problem with bleeding through the paving fabric, which ultimately will stick to equipment tires and further damage the fabric. Hence, for future projects it may be appropriate to construct two test sections for both milled and non-milled sections to determine the correct tack coating application rates. In addition, it was important to perform onsite measurements of the application rates to ensure that the readings and measurements from machines and equipments were correct.

Second, it is always best to remove the wrinkles from the paving fabric during (preferred) or directly after placement of the fabric on the roadway, which will reduce the man power needed and time spent removing wrinkles. This process is very important, particularly in situations where the sections are long and there are only one or two workers assigned to this specific duty, as experienced on this project. Allowing the fabric to completely bond to the tack coating, particularly on the milled sections, poses significant problems in wrinkle removal, and ultimately results in damaging the fabric due to excess tensile stress. In situations where complete bonding becomes a problem, wrinkles have to be cut, which could create voids, and result in areas where cracks could propagate in the future.

7. Summary and Conclusion

In summary, the construction of the research sections was successful and was completed one week prior to the specified time period in the proposal. Proper installation and equipment is critical for optimum performance. Fortunately, there were only minor problems encountered during this project, which should produce excellent results. The successful construction of paving fabric research sections in this project should facilitate the investigation of the long-term performance of the research sections.

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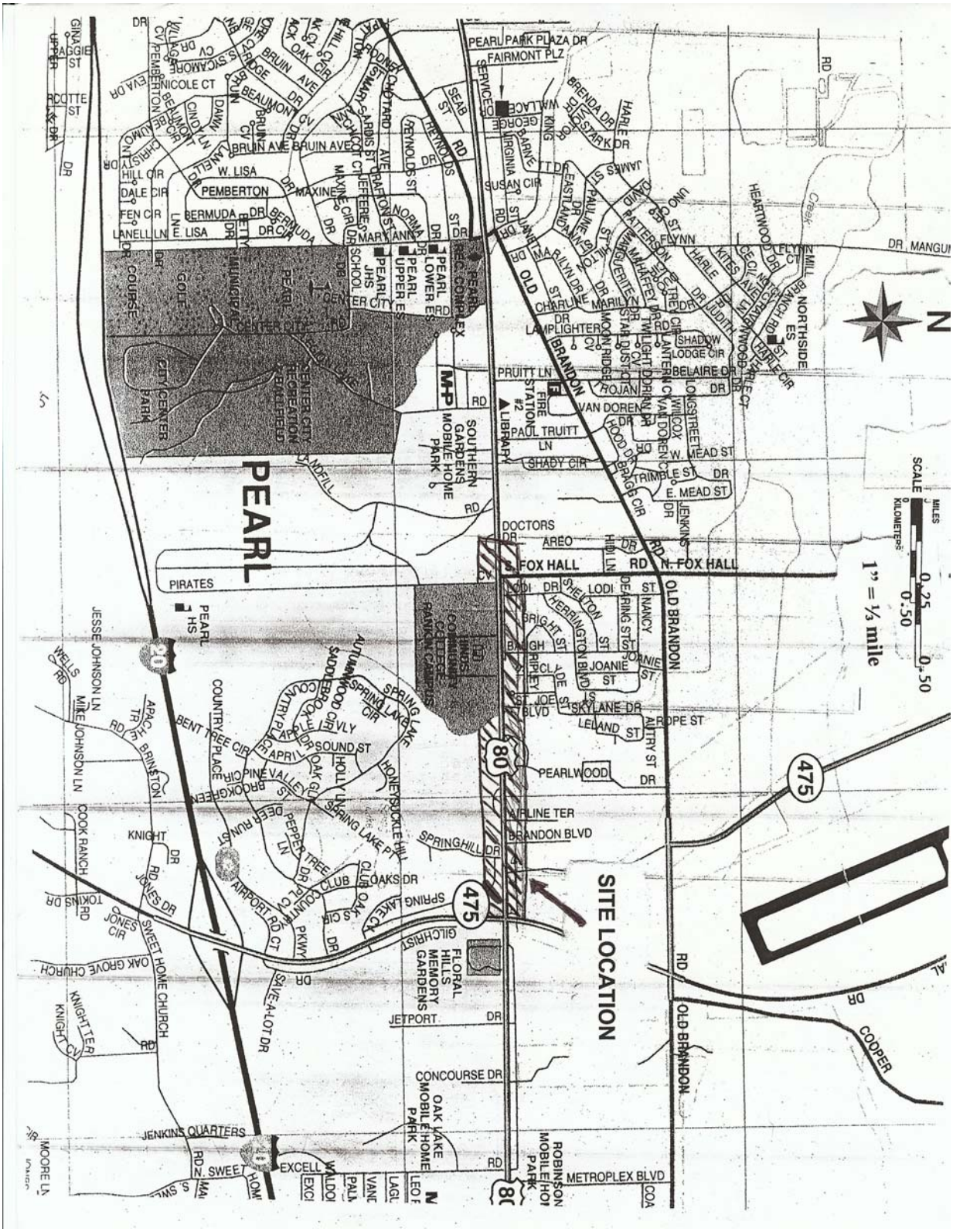
APPENDIX I

Site Map



Site Location

APPENDIX II

Specifications

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-409-1 **CODE: (SP)**

DATE: 03/06/2007

SUBJECT: Geotextile Fabric For Underseal

PROJECT: STP-7314-00( )MP / 104956301 -- Rankin County

Section 409, Geotextile Fabric for Underseal, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is deleted in total and replaced as follows:

SECTION 907-409 – GEOTEXTILE FABRIC FOR UNDERSEAL

907-409.01--Description. This work shall consist of furnishing and placing a geotextile paving fabric beneath an asphalt pavement overlay to provide a water-resistant membrane and crack-retarding layer.

907-409.02--Materials.

907-409.02.1--Paving Fabric: The paving fabric shall be a polypropylene, staple fiber, needle-punched, nonwoven material. The paving fabric shall be resistant to chemical attack, rot and mildew and shall have no tears or defects that will adversely alter its physical properties. The fabric shall be specifically designed for pavement applications and be heat-set on one side to reduce bleed-through of tack coat and to minimize fabric pick-up by construction equipment during installation. The fabric shall conform to AASHTO M288-92, and shall meet the requirements specified in Table 1.

Table 1 Minimum Requirements of Paving Fabrics

Properties	American Standard	Test Method
Mass Per Unit Area	4.0 oz / sq yd	ASTM D 3776
Tensile Strength	90 lb	ASTM D 4632
Tensile Elongation	50%	ASTM D 4632
Asphalt Retention	0.20 gal / yd^2	ASTM D 6140
Melting Point	300º F	ASTM D 276-87
Surface Texture	Heat-Set On One Side	Visual Inspection

A Manufacturer's Certification and 5 S.Y. sample, for each lot, and each shipment is required to be furnished to the Engineer for testing prior to construction of the required 300' test section. The fabric sample(s) is/are to be submitted for testing no less than 3 working days prior to the beginning of construction. Test results must indicate specification compliance before construction of the test strip or research sections may begin. Lots represented by failing samples shall be rejected.

907-409.02.2--Tack Coat. The tack coat used to impregnate the fabric and bond the fabric to the pavement shall be either a cationic (CSS-1 per AASHTO M180) or anionic (SS-1 per AASHTO M140) emulsion. The Contractor shall follow the recommendations of the paving fabric manufacturer when applying the emulsified asphalt tack coat. The use of cutbacks or emulsions that contain solvents shall not be permitted. Pre-testing of the emulsion is required. A representative sample of the emulsion shall be obtained from the distributor truck for testing no less than 3 working days prior to commencement of the tack coat application. Test results must indicate specification compliance before construction of the test strip or research sections may begin. Quantities of emulsion represented by failing samples shall be rejected.

907-409.03--Construction Requirements.

907-409.03.1--Test Section. Prior to full scale production of the four control and eight research sections addressed under Notice To Bidders No. 1381, Scope of Work, the Contractor shall construct a separate test section for the purpose of evaluating the application of tack and geotextile paving fabric. The Contractor shall construct a test section at least 300 feet long and one lane wide (12') in the outside lane. The test section shall be constructed with the same equipment, personnel and anticipated application rates that will be used during construction of the project. The test section shall be placed at the east end of the research sections. Payment for this work will be made under the appropriate contract pay items. The tack coat application and paving fabric placement shall meet all applicable specifications. If the initial test section demonstrates that the contractor is capable of placing the tack coat and paving fabric in accordance with the specifications, construction of the research sections may commence. If the contractor is unable to demonstrate his ability to install the tack coat and paving fabric in accordance with these specifications, he shall remove the paving fabric, make any necessary adjustments to his operation and construct a second test section. No payment shall be made for unsatisfactory work performed during construction of a test section. Construction of the research sections shall not begin until a test section has been constructed in accordance with these specifications and accepted by the Engineer.

907-409.03.2--Shipping and Storage. The paving fabric shall be kept dry and wrapped such that it is protected from the elements, including direct sunlight, during shipping and storage. If stored outdoors, the fabric shall be elevated and protected with a waterproof cover. The paving fabric shall be labeled in accordance with ASTM D 4873-88, "Standard Guide for Identification, Storage, and Handling of Geotextiles."

907-409.03.3--Weather Limitations. The air and pavement temperatures shall be at least 60ºF and rising for placement of asphalt emulsion. Neither asphalt tack coat nor paving fabric shall be placed on wet pavement.

907-409.03.4--Surface Preparation. The pavement surface shall be dry and thoroughly cleaned by sweeping, blowing, or other methods until all dust, dirt, mud, vegetation, oil, and other foreign materials are removed entirely from the pavement before the tack coat

is applied. In test sections 3, 9, and 11, cracks from 1/8" to 3/8" wide shall be cleaned by compressed air and filled with hot poured elastic joint sealer meeting AASHTO M324. The hot poured joint sealer material shall be allowed to cure for a minimum of 24 hours prior to placement of paving fabric. Cracks greater than 3/8" wide shall be cleaned by compressed air or other means approved by the Engineer to a depth of at least 1/2" and filled with HMA, 9.5mm Mix and compacted. Potholes and other pavement distress shall be repaired with HMA, 9.5mm Mix as directed by the Engineer. Payment for cleaning and sealing cracks and for any pavement repair necessary prior to placement of fabric shall be paid for at the contract unit bid prices for Pay Item 403-A, Hot Mix Asphalt, MT, 9.5mm Mix or for Cleaning and Sealing Cracks-- Pay Items 413-A: Joint Sealer Material per gallon and 413-C: Cleaning and Sealing Cracks per linear foot. .

907-409.03.5--Tack Coat Application. The tack coat shall be applied using a properly functioning, calibrated distributor spray bar. The tack coat shall be applied uniformly to the prepared, dry pavement surface. The tack coat application rate must be sufficient to saturate the fabric and to bond the fabric to the existing pavement surface. The tack coat application rate shall be 0.22 to 0.30 gallons per square yard depending upon the relative porosity of the old pavement, ambient temperature, and tack coat. Because emulsified asphalt is being specified, the application rate must be increased as directed by the Engineer to offset the water content of the emulsion. The final application rate will be determined based on the results of the 300' test section. Within street intersections, on steep grades or in other zones where vehicle speed changes are common, the normal application rate shall be reduced by about 20 percent as directed by the Engineer, but to not less than 0.20 gallons per square yard.

The temperature of the tack coat shall be sufficiently high to permit a uniform spray pattern. The distributor tank temperatures shall be maintained between 130ºF and 160ºF.

The Tack coat shall be applied six (6) inches wider than the width of paving fabric, except in test sections 4, 5, and 7, which are to be milled. Tack coat application shall be wide enough to cover the entire width of fabric overlaps. The tack coat shall be applied only as far in advance of paving fabric installation as is appropriate to ensure a tacky surface at the time of paving fabric placement. Traffic shall not be allowed on the tack coat. Excess tack coat shall be cleaned from the pavement.

Paving Fabric Placement: ONLY construction equipment is to be allowed on the paving fabric prior to HMA overlay. When placing the fabric, the shiny, heat-bonded side shall be up, exposed to construction equipment. If the fabric is placed in extreme temperatures (90º to 95ºF), a small amount of sand should be placed on it, to keep construction equipment from picking up the material. Any excess sand should be swept off before placing the overlay.

The paving fabric shall be placed onto the tack coat using mechanical or manual laydown equipment capable of providing a smooth installation with a minimum amount of wrinkling or folding. Wrinkles larger than ½ inch should be slit at the bottom of the wrinkle and laid flat. Overlaps and slit wrinkles should be laid on top of each other. All

wrinkles and overlaps in the fabric shall be addressed in accordance with these specifications. Paving fabric shall not be installed in areas where the compacted thickness of the asphalt overlay is less than 1.5 inches.

The emulsion shall be allowed to cure properly such that essentially no water moisture remains prior to placing the paving fabric. Fabric wrinkles severe enough to cause folds shall be slit and laid flat. Brooming and rubber-tire rolling shall be required to maximize paving fabric contact with the pavement surface. Additional hand-placed tack coat may be required at overlaps and repairs as required by the Engineer.

Turning of the paver and other construction equipment shall be done gradually and kept to a minimum to avoid movement and damage to the paving fabric. Abrupt starts and stops shall also be avoided. Damaged fabric shall be removed and replaced with the same type of fabric and a tack coat, at no additional cost to the State.

907-409.03.6--Joints and Overlaps. Any overlap of the paving fabric should be minimized, although an overlap of one to three (1 to 3) inches is recommended. Extra tack coat should be placed at the location of overlap. End joints and joints from repair of wrinkles should be made to overlap or "shingle" in the direction that the pavement overlay will be placed. A uniform application of tack coat shall be applied between all fabric overlaps. Any locations that do not have tack between the overlaps shall be corrected by manual placement of tack coat prior to overlay construction.

All areas designated to receive paving fabric shall be overlayed the same day that the fabric is placed. No traffic except necessary construction traffic shall be allowed to drive on the paving fabric. If the paving fabric becomes wet during installation, it shall be allowed to dry completely before paving. Blisters may form under the paving fabric before overlay construction if the pavement is saturated with water. To prevent delamination of the overlay, this must be corrected by rolling the paving fabric with a rubber-tire roller until the fabric adheres to the pavement surface before the overlay is placed.

907-409.03.7--Equipment. A tractor or similar mechanical device with mounted lay down equipment and suitable roll tension devices that are capable of handling full rolls of fabric shall be used. The equipment shall be capable of laying the paving fabric smoothly without excessive wrinkles and/or rolls. Miscellaneous equipment such as bristle brooms used to smooth, and scissors or blades used to cut the paving fabric shall be provided by the contractor. A pneumatic-tire roller shall be used, in order to ensure adherence of the paving fabric to the pavement surface.

907-409.03.8—Contractor's Qualifications. The contractor responsible for paving fabric installation must be a specialized contractor, experienced in the placement of paving fabrics.

907-409.03.9--Quality Control. The Contractor shall be responsible for quality control, and shall ensure that all materials and workmanship **STRICTLY** comply with these

specifications. Upon completion of each phase of work within each of the research sections, the Engineer shall evaluate the quality of the work performed. Any work found not to be in compliance with the specifications shall be corrected by the Contractor at no additional cost to the State before he is allowed to proceed with the next phase of the work.

907-409.03.10--Overlay Placement. Asphalt overlay construction shall closely follow fabric placement. All areas in which paving fabric has been placed shall be paved during the same day. Excess tack coat that bleeds through the paving fabric shall be removed. Excess tack coat may be removed by broadcasting hot mix or sand on the paving fabric. Excess sand or hot mix shall be removed before beginning the paving operation. In the event of rainfall on the paving fabric prior to the placement of the asphalt overlay, the paving fabric shall be allowed to dry completely before asphalt is placed. Overlay asphalt thickness shall meet the requirements of the contract drawings and documents. The minimum compacted thickness of overlay asphalt shall not be less than 1.5 inches in areas of paving fabric installation.

907-409.04--Method of Measurement. Geotextile fabric for underseal, placed in accordance with these specifications and as directed by the Engineer, will be measured by the square yard of surface area. Any over-width of material installed and additional material required for laps will not be measured.

Emulsified asphalt for fabric underseal, applied in accordance with these specifications and as directed by the Engineer, will be measured by the gallon in accordance with Subsections 109.01 and 410.04. Any blotting with sand or other material, rolling to restore bond and application of the tack coat required prior to HMA overlay will not be measured for payment and is considered incidental to completion of the work.

907-409.05--Basis of Payment. Geotextile fabric for underseal, measured as prescribed above, will be paid for at the contract unit price per square yard, which price shall include all incidentals necessary to complete the work.

Emulsified asphalt for fabric underseal, measured as prescribed above, will be paid for at the contract unit price per gallon, which price shall include all incidentals necessary to complete the work.

Payment will be made under:

907-409-A: Geotextile Fabric for Underseal - per square yard

907-409-B: Emulsified Asphalt for Fabric Underseal - per gallon

APPENDIX III

Lab Report

RPT ID: RMMLABR
USER: dbledsoe

15-14

Mississippi
Department of Transportation
Lab Report

DATE: 07/18/2007
PAGE: 1 of 1

Sample ID: 071514JTP0002 Sample Test Nbr: 1 Sample Date: 07/10/2007 Log Date: 07/12/2007
Sampled By: mdean Name: Dean, Max Sample Type: Research
Material: 071400015 GEOTEXTILE TYPE IV Represented Qty: 5333
Prod/Supp: ENTER REMARKS Product Nm:
Test Method: CPE901 Project Engineer Certification
Lab Name: MDOT PROJECT OFFICE (15-14) - NEWTON Plant:
Use Text: UNDERSEALING From Text:

Contract/Project/Line Item: CSTP7314000019M 104956301000 0460 Item:
Engineer: Nail, Chris Prime Contractor: APAC - Mississippi, Inc.
Description: Milling and Overlaying
Location: Rankin County
Prj Loc or Engr for Lab Rpt: Hwy 80 Rankin County

Disposition Remarks:

Standard Remarks: This material has been tested in accordance with MDOT specifications and is satisfactory for use in MDOT projects.

Sampled By: Authorized By: dbledsoe Signed: _____
Authorized Date: 07/18/2007 Date: _____

Aug 08 07 07:22a Newton Project Office 601-683-3506 p.2

	50	99999999
MD		
Elongation %:	50	99999999
CMD		

AOS:

Remarks:

Remarks:

Remarks:

Test Methods:

ASTM D4751, D4632 and D4533

Disposition Remarks:

Standard Remarks: This material has been tested in accordance with MDOT specifications and is satisfactory for use in MDOT projects.

Sampled By:

Authorized By: dbledsoe
Authorized Date: 07/18/2007

Signed: _____
Date: _____

RPT ID: RMMLABR
USER: dbledsoe

Mississippi
Department of Transportation
Lab Report

DATE: 07/18/2007
PAGE: 1 of 2

Sample ID: 071514JTP0002 Sample Test Nbr: 1 Sample Date: 07/10/2007 Log Date: 07/12/2007
Sampled By: mdean Name: Dean, Max Sample Type: Research
Material: 071400015 GEOTEXTILE TYPE IV Represented Qty: 5333
Prod/Supp: ENTER REMARKS Product Nm:
Test Method: FSLK215 Permittivity for Geotextile Fabric
Lab Name: MDOT CENTRAL SOILS LAB (72-30) - JXN Plant:
Use Text: UNDERSEALING From Text:

Contract/Project/Line Item: CSTP7314000019M 104956301000 0460 Item:
Engineer: Nail, Chris Prime Contractor: APAC - Mississippi, Inc.
Description: Milling and Overlaying
Location: Rankin County
Prj Loc or Engr for Lab Rpt: Hwy 80 Rankin County

Effective Date: 02/24/04 Reviewer ID: rholland

Field Name	Results Data	Minimum/Maximum
Specimen 1		
Trial		
Time(s)		
1	2.5600	
2	2.6800	
3	2.6200	
4	2.6200	
5	2.5900	
Average (s)	2.6140	
Permittivity	1.9730	-99999999 99999999
Specimen 2		
Trial		
Time(s)		
1	3.7500	
2	3.6500	
3	3.6900	
4	3.7500	
5	3.8000	
Average (s)	3.7280	
Permittivity	1.3830	-99999999 99999999
Specimen 3		

Disposition Remarks:

Standard Remarks: This material has been tested in accordance with MDOT specifications and is satisfactory for use in MDOT projects.

Sampled By:

Authorized By: dbledsoe
Authorized Date: 07/18/2007

Signed: _____
Date: _____

Aug 08 07 07:22a Newton Project Office 601-683-3506 p.4

APPENDIX IV

Daily Construction Reports

DAY 1: Monday 30 July, 2007

Superintendent Philip Forman from APAC Construction Company closed off the project lane at 8:30am by placing cones along the centerline of the roadway and across the west bound turning lane along highway 475 south. At 8:45 am, Burns Cooley and Dennis, Inc. geotechnical firm started cutting cores, using a one and two-man crew and two-core cutting machines connected to the back of two pickup trucks (see Figures 17 and 18). They completed 17 core cuts by the end of the work day at approximately 3:30pm. They sealed the core holes along the 300-ft test section using pavement mix.

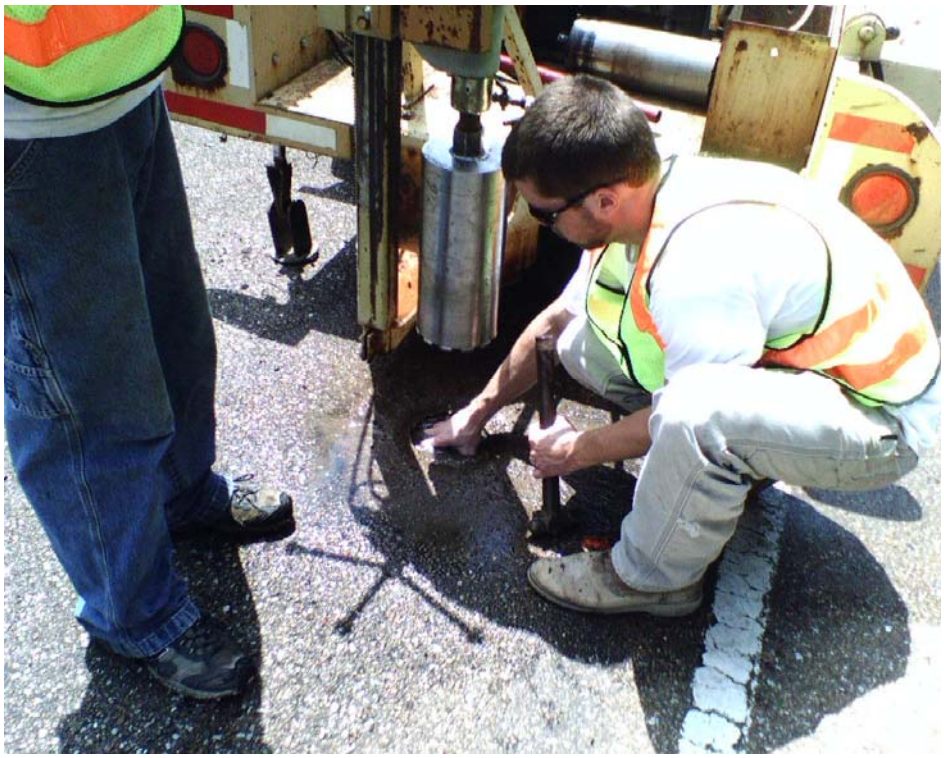


Figure IV-1. Cutting Cores in Section 7

Figure IV-2. Core Cutting Machine

The milling then began at 10:50 am from station 295+00 to station 292+00 using a Roadtec milling machine. The road width was only about 10 ft ¾ inches wide, and the paving fabric was 12-ft 6 inches wide. Consequently, a decision was made to mill 12 feet 10 inches to compensate for the paving fabric. The road was brushed using mechanical brushes, and excess debris were removed using rubber tire backhoes. Mississippi Paving Company applied the tack coating at 1:24 pm at a rate of 0.25 gal/sq.yd using a specialized tack coating truck. The application of the tack coating was not uniform. As a result, tacking was discontinued at 1:40 pm. The test section was then repaved without any further construction. A test application rate was performed off site at the APAC Lab at approximately 2:45 pm where the problem was corrected. The valves on the truck were not opened to release the tack, and the starting distance was not adequate during

application. The valves were oiled and the temperature of the tack coating was increased from 105° to 130°.

DAY 2: Tuesday 31 July, 2007

After closing the lane at 8:30am, Mississippi Paving Company milled the 300-ft test section once again as well as sections 1, 2, and 3, from station 295+00 to station 274+50. Before applying tack coat to the 300-ft test section, geotechnical engineers placed square pans with areas equal to 0.2431 square yards on the milled surface to measure the weight of the tack coat to ensure the correct application rate (see Figures 19 and 20). After applying the tack coat, the mass of the coating collected on the pan was 0.35lbs (0.039gals). The calculated rate was 0.16 gal/sq yd, and since the tack coating consisted of 60% emulsion and 40% water (dividing 0.16 by 0.60), the measured application rate was 0.25 gal/sq yd, which was the exact gage reading on the truck.

Figure IV-3. Dry Pan before Tack Coating of Test Section

Figure IV-4. Pan used for Onsite Measurement of Tack Coating Application Rate after Tacking

After coating, the paving fabric was installed by Cheek's Construction Company using a rubber tire tractor with a special attachment on the front end. Two workers stood on opposite ends of the roll of fabric to direct the operator and ensure correct placement. After laying the fabric, the wrinkles were removed manually by pulling both ends of the fabric before adhering to the tack coat. When the placement was satisfactory, paving of the test section was completed in section 1 from station 291+50 to station 286+50. Paving was completed at approximately 2:45 pm in order to allow lane re-opening.

During this day, Burns Cooley and Dennis, Inc. continued cutting cores and completed 10 core cuts at the end of the work day, while Sunbelt Sealing, Inc. began cleaning cracks for sealing at 9:00 am using a blower at sections 5 and 7, from station 268+50 to 263+50 and station 257+56 to 252+50, respectively. After cleaning, sealing

began, where section 5 was cleaned and sealed before moving on to section 7. Section 7 was sealed from station 257+50 to 255+50 to allow the sealant to cure in preparation for lane re-opening.

DAY 3: Wednesday 1 August, 2007

After closing the construction lane, the contractor cut cores in the test section at station 294+30, and in section 1 at station 290+98. Burns Cooley and Dennis, Inc. continued cutting cores in section 10, while Sunbelt Sealing, Inc. resumed sealing cracks in section 7, (cracks were cleaned before re-sealing), from station 255+50 to station 252+50, and cleaned and completed the sealing in section 11 from station 234+50 to station 229+50. There was no paving done on this day because the distributor malfunctioned on the tack coating truck.

DAY 4: Thursday 2 August, 2007

APAC Construction and Mississippi Paving Company removed the key joint at the end of section 1 at station 286+50 at 9:15am. Cheek's Construction then laid paving fabric from the end of section 1 at station 286+00, to the end of section 3 at station 274+50, all at once before paving took place. They then placed fabric in section 6 from station 263+00 to station 258+00. Figure 21 shows a 6" overlap of paving fabric placed from the end of one roll of fabric to the beginning of another.

Figure IV-5. Overlapping Fabric

Rubber tire hoes were then used to smooth out the wrinkles to less than ½ of an inch before paving began. During the first stages of paving, there was dirt from the back of the dump truck mixed with the asphalt. Hence, the batch had to be discarded and a new truck of asphalt was brought in. Sand had to be placed on top of the paving fabric in section 6 because of the excessive bleeding of the tack coating. The sand was supposed to be removed before paving began. However, 150ft of section 6, from station 263+00 to station 261+50, was paved before the sand was removed. Paving of section 7 was completed at approximately station 252+20 at 2:45pm, which ultimately, was the end of the work day.

DAY 4: Friday 3 August, 2007

The key joint was removed from the end of section 7, and Cheek's Construction began laying fabric in section 8 from station 252+20 to station 247+00. Tack coating was applied at a rate of 0.20 gal/sq yd instead of 0.25 gal/sq yd because of the excess bleeding through the paving fabric on the smooth roadway surfaces. Mississippi Paving Company paved the final 1.5 inch overlay in section 3 to a final overlay of 3 inches. Paving was completed in section 8 from station 252+00 to station 247+00 and also sections 9, 10, 11, and 12, from station 245+50 to station 224+00. Paving ended at station 222+35 for the day.

APPENDIX V

Additional Pictures

Figure V-1. Sealed Cracks in Section 11

Figure V-2. Sealed Cracks in Section 11

Figure V-3. Core Cut

Figure V-4. Pavement Quality Indicator

Figure V-5. Milling Machine

Figure V-6. Applying Tack Coat to Test Section

Figure V-7 Uniform Tackcoat on Section 5

Figure V-8. Checking Thickness of Coating

Figure V-9. Preparing to Place Paving Fabric

Figure V-10. Research Team Onsite